MONTANA FISH, WILDLIFE & PARKS

ENVIRONMENTAL ASSESSMENT
Native Westslope cutthroat trout establishment in Martin Creek

Native Westslope cutthroat trout establishment in Martin Creek

Draft Environmental Assessment

June 12, 2020

Montana Fish, Wildlife & Parks
Region 1 Office
490 N. Meridian Rd
Kalispell, MT 59901

Montana Fish, Wildlife & Parks

Executive Summary

The proposed action would entail chemical removal of Yellowstone cutthroat / Rainbow hybrids in Martin Creek, which is part of the Stillwater River drainage (Figure 1). CFT Legumine, a commonly used formulation of rotenone, would be the piscicide used to remove fish. After chemical removal, the proposed action calls to restore native, nonhybridized Westslope cutthroat trout (Oncorhynchus clarkii lewisi) to Martin Creek. After successful removal of fish, Martin Creek would be restocked with native, nonhybridized Westslope cutthroat trout from the best available source in the Stillwater drainage. Fish availability, genetic status, and proximity would guide selection of the specific donor source.

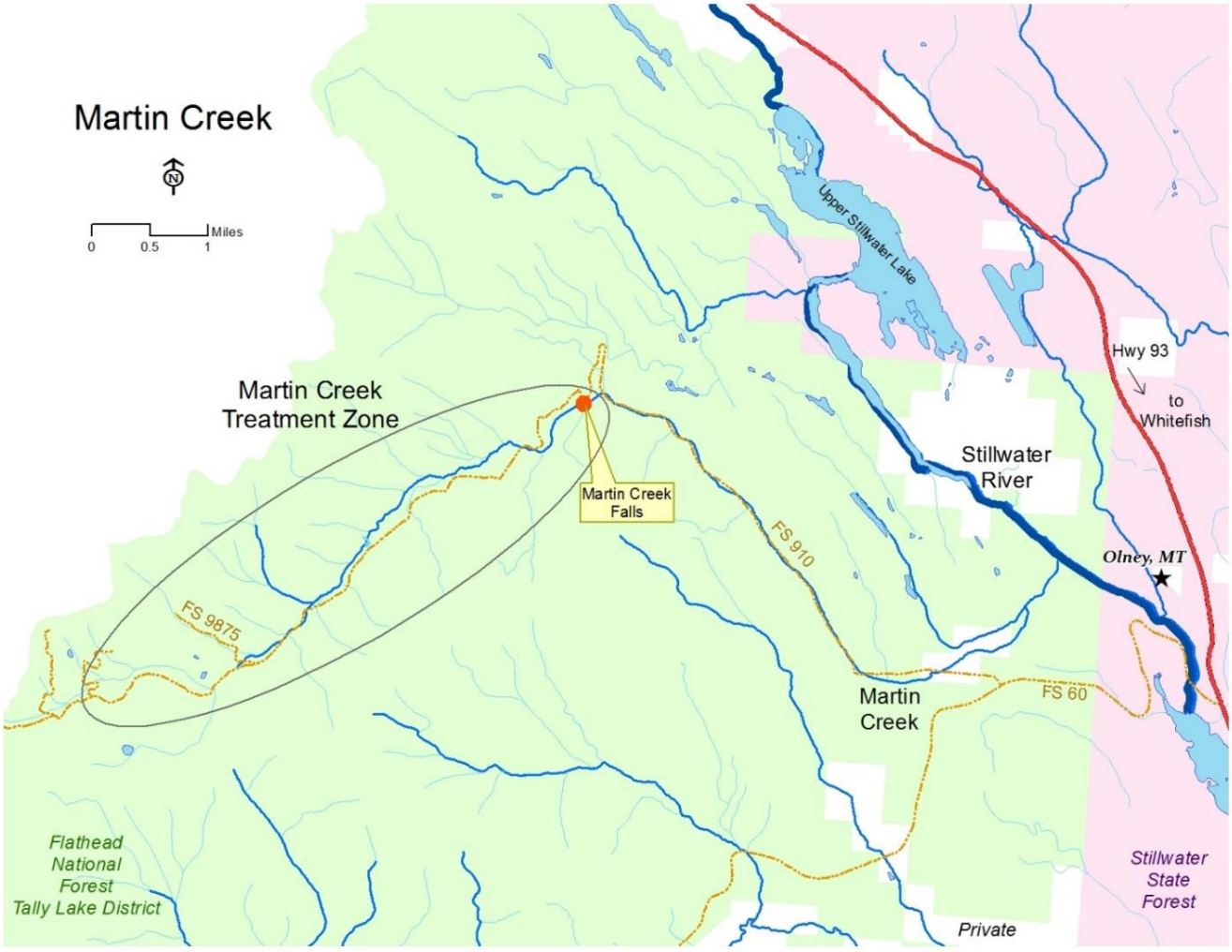

Figure 1. Martin Creek Location

The conservation and inherent value of native Westslope cutthroat trout is substantial. Unfortunately, Westslope cutthroat trout have experienced marked reductions in numbers and distribution. Securing a population of nonhybridized Westslope cutthroat trout within the Stillwater drainage would secure an invaluable component of this special area's natural heritage for future generations to enjoy. Moreover, conservation of native fish brings a range of benefits to local communities and is required under state and federal law.

Westslope cutthroat trout in Martin Creek face several threats. Past logging practices have left clear cuts and roads that contribute to surface erosion and siltation. In addition, invasion and / or historic stocking of nonnative rainbow trout (O. mykiss), nonnative Yellowstone cutthroat trout (O. clarkii bouvieri), and nonnative brook trout (Salvelinus fontinalis) have compromised the genetic composition and increased competition for the Martin Creek population. This project would provide an opportunity for a genetically pure population of Westslope cutthroat trout to become established above a natural barrier which is secure from brook trout invasion.

This collaborative effort includes Montana, Fish, Wildlife & Parks (FWP) and the Flathead National Forest, Tally Lake Ranger District, and focuses on eliminating the threats posed by nonnative species in the Stillwater drainage, which includes Martin Creek. Several actions have preceded this environmental assessment (EA) including population estimates, genetic testing, and habitat surveys.

EAs are a requirement of the Montana Environmental Policy Act (MEPA) and the National Environmental Policy Act (NEPA), which require state and federal agencies to consider the environmental, social, cultural, and economic effects of proposed actions. This EA considers potential consequences of two alternatives to conserve native fish in Martin Creek. The third alternative listed is a dismissed alternative that has been proven ineffective in meeting the objective of full removal of hybrid trout. The 3 alternatives considered are:

Alternative 1: No action

Alternative 2 (Preferred): Use the piscicide CFT Legumine to remove the existing fishery and restock with nonhybridized Westslope cutthroat trout from the best available source.

Alternative 3: Mechanical removal using backpack electrofishers.

Alternative 4: Angling

Alternative 2 is the preferred alternative. It would have short-term, minor effects on wildlife, recreation, and vegetation. This alternative would be highly beneficial to Westslope Cutthroat Trout and would be a substantial contribution to the long-term conservation of the species in the Stillwater River drainage.

MEPA requires public involvement and opportunity for the public to comment on projects undertaken by the acts' respective agencies. A public comment period will extend from June 15, 2020 to July 15, 2020. Interested parties should send comments to:

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List of Abbreviations

ARM	Administrative Rules of Montana
BMI	Benthic macroinvertebrates
CGNF	Custer Gallatin National Forest
DEGEE	diethyl glycol monoethyl ether
DEQ	Montana Department of Environmental Quality
EA	Environmental Assessment
EPT	Ephemeroptera, Plecoptera, Trichoptera (mayflies, stone flies, & caddis flies)
FS	Forest Service
FWP	Montana Fish, Wildlife & Parks
GMU	Geographic management unit
$KMnO_4$	potassium permanganate
MCA	Montana Code Annotated
MCTSC	Montana Cutthroat Trout Steering Committee
MEPA	Montana Environmental Policy Act
MNHP	Montana Natural Heritage Program
MOU	Memorandum of understanding
MRDG	Minimum Requirements Decision Guide
MSDS	Material data safety data sheet
NEPA	National Environmental Policy Act
NPS	National Park Service
PEG	Polyethylene glycol
SNF	Shoshone National Forest
SNP	Single Nucleotide Polymorphism
SOC	Species of Concern
USEPA	United States Environmental Protection Agency
WCT	Westslope Cutthroat Trout
WFGD	Wyoming Fish and Game Department
YNP	Yellowstone National Park

2 PROPOSED ACTION and BACKGROUND

2.1 *Type of Proposed Action*

The proposed action would create a secure population of genetically pure Westslope cutthroat trout (WCT) in the Stillwater drainage. This drainage was home to aboriginal populations of non-hybridized WCT which have become greatly reduced in distribution and abundance due to hybridization, nonnative fish competition and predation. If the project is successful, it is likely that the Martin Creek population will be one of the only secure populations of WCT in the Stillwater drainage. Non-native hybrid trout upstream of the natural barrier will be removed using the piscicide rotenone in the formulation of CFT Legumine (5% rotenone). This restoration project would result in expanding the range of WCT in the Stillwater drainage.

2.2 *Agency Authority for the Proposed Action*

FWP is required by law (§87-1-201(9)(a) Montana Code Annotated [MCA]) to implement programs that manage sensitive fish species in a manner that assists in the maintenance or recovery of those species, and that prevents the need to list the species under § 87-5-107 MCA or the federal Endangered Species Act. Section 87-1-201(9)(a), M.C.A. (Table 1).

FWP is a signatory to the Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana (FWP 1999, 2007; Table 1) which states: "The management goal for WCT in Montana is to ensure the long-term, self-sustaining persistence of the subspecies within each of the five major river drainages they historically inhabited in Montana, and to maintain genetic diversity and life history strategies represented by the remaining local populations."

According to the FWP Statewide Fisheries Management Plan, the restoration goal for WCT east of the Continental Divide (Upper Missouri River Basin upstream from and including the Judith River) is to restore secure conservation populations of WCT to 20% of the historic distribution (FWP 2012). Populations of WCT are considered secure by FWP when they are isolated from non-native fishes, typically by a physical fish passage barrier, have a population size of at least 2,500 fish, and occupy sufficient (5 to 6 miles) habitat to assure long-term persistence. Currently WCT (including slightly hybridized population > 90% WCT) occupy approximately 5% of their historic habitat.

Montana state law authorizes FWP to manage wildlife, fish, game and nongame animals to prevent the need for listing under the Endangered Species Act or ESA, and listed, sensitive, or species that are candidates for listing under the ESA must be managed in manner that assists in the maintenance or recovery of the species (MCA§ 87-5-107). In waters where FWP is seeking to remove or control unauthorized species, FWP must endeavor to protect the previously existing

fishery and suppress or eradicate the unauthorized species to maintain the existing management objectives for that fishery (ARM 12. 7. 1501[4]). Montana state law also allows the use of chemicals to remove fish (ARM 12. 7. 1503[1][f][ii]).

Table 1. Planning and strategy documents with relevance to Martin Creek.

Agency	*Citation*	*Website*
Montana Cutthroat Trout Steering Committee (MCTSC)	Memorandum of Understanding and Conservation Agreement for Westslope Trout and Yellowstone Cutthroat Trout in Montana (2007)	http://fwp. mt. gov/fishAndWildlife/management/yellowstoneCT/
Multiple	(May 2000) Memorandum of Agreement for Conservation and Management of Yellowstone Cutthroat Trout among MT, ID, WY, NV, U. S. Forest Service YNP, Grand Teton National Park. (2000)	http://www. fws. gov/mountain-prairie/species/fish/yct/archive/Microsoft%20Word%20-%20YCT-MOU. pdf
FWP	Montana Statewide Fisheries Management Program and Guide (2019-2027)	file:///C:/Users/CF4030/Downloads/2019-2027%20SFMPG.pdf
FWP	Wild Fish Transfer Policy (1996)	http://fwp. mt. gov/fishAndWildlife/management/westslopeCT/default. html
FWP	Piscicide Policy (2017)	Internal document
USFWS	Endangered Species Act	http://www. fws. gov/endangered/Endangered Species Act-library/pdf/Endangered Species Actall. pdf

2.3 *Estimated Commencement Date*

Fish removal: August 2020

Re-establish population – 2021-2023

2.4 *Name and Location of the Project*

Environmental Assessment for Native Westslope Cutthroat Trout Establishment in Martin Creek.

Martin Creek is in the Stillwater River watershed, which drains to the Stillwater River (Figure 2). The project is in Flathead County, approximately 5 miles from Olney, Montana. The legal description is Township T30N, Range R22W, in section S28.

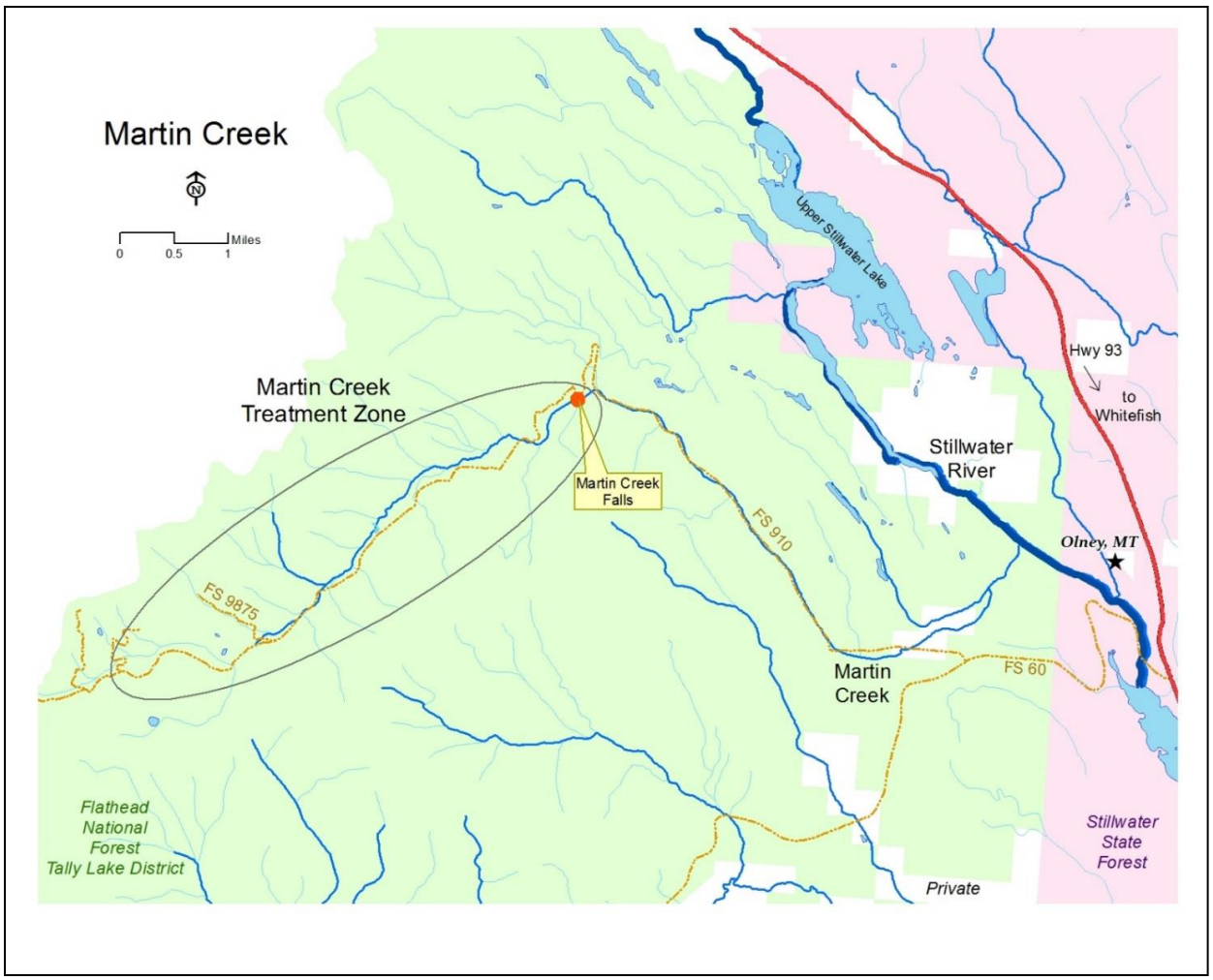


Figure 2. Map of project area.

2.5 *Project Size (Affected Area)*

1.	Developed/residential	0 acres
2.	Industrial	0 acres

3.	Open space/woodland/recreation	0 acres
4.	Wetlands/riparian areas	5 miles
5.	Floodplain	0 acres
6.	Irrigated cropland	0 acres
7.	Dry cropland	0 acres
8.	Forestry	0 acres
9.	Rangeland	0 acres

The Martin Creek treatment area is 5 miles long. It has no significant tributaries that enter along the treatment zone. Flow measurements taken on September 21, 2017 which are representative of base flow, i.e. when we would conduct the treatment, documented a discharge of 2.4 cfs at the bridge crossing upstream of barrier falls and 0.41 at the upper FS road 5315 crossing (Figure 4).

2.6 *Narrative Summary of the Proposed Action and the Purpose of the Proposed Action*

2.6.1 Summary and Background

It is unknown if fish historically inhabited Martin Creek. Waterfalls at the mouth and mid drainage prevent upstream fish passage. Extensive stocking in the drainage has occurred in Martin Creek and Martin Lakes.

A waterfall at the confluence of Martin Creek and the Stillwater River blocked upstream fish passage. Non-native brook trout were stocked in the lower half of Martin Creek. Brook trout expanded their distribution upstream to Martin Creek Falls (Figure 1) and are a self-sustaining population. Various electrofishing efforts in 2009 found a relative abundance of about 25 brook trout per 50m.

An unnamed tributary to Martin Creek has two large in-channel wetlands called Martin Lakes. Martin Lakes were stocked with westslope cutthroat trout in 1974. During the early 1980's non-native northern pike were illegally introduced and by late 1990's yellow perch and pumpkinseed sunfish also appeared. These species eliminated the trout and the quality of fishing was considered poor. In 2005 Montana FWP applied rotenone to both lakes and restocked them with westslope cutthroat trout. The outlet stream has intermittent connectivity to Martin Creek. Low numbers of westslope cutthroat trout are found in the outlet stream while lower Martin Creek itself has only brook trout.

The upper half of Martin Creek, above the Martin Creek Falls, had Yellowstone cutthroat trout stocking conducted in 1938, 1939, 1949 and 1950. Biologists during that period were not able to distinguish cutthroat trout subspecies and hatchery fish often had multiple sources from various subspecies. The *Oncorhynchus* species placed in upper Martin Creek became self-sustaining and no further stocking took place after 1950. Various population estimates in upper Martin Creek ranged from 104 *Oncorhynchus* per 100m near the falls but just 15 per 100m further upstream. Genetic testing of 25 individuals in 2001 found they were hybridized Yellowstone cutthroat trout x rainbow trout x westslope cutthroat trout. No other fish species exists in upper Martin Creek.

The upper Martin watershed is entirely on National Forest system lands. The landscape is utilized for timber harvest and the area has no recreational developments, no grazing, no mining and presumably little recreational fishing. Habitat sampling in upper Martin Creek found the stream has numerous pools, stable banks and plenty of woody debris cover. However spawning habitat may be limited by a high percentage of fine-sized substrates covering gravels. This may be a natural condition of calcium carbonate precipitate (called "marl") or may reflect past land management. In 2010 an inventory of all roads in Martin Creek found several problem areas and these were corrected in 2015.

2.6.2 Proposed Action

This project will secure a nonhybridized, genetically pure population of Westslope cutthroat trout in Martin Creek by removing the existing hybrid trout using the piscicide rotenone. Following the treatment, Martin Creek will be stocked with genetically pure WCT from Sheppard creek, in the Stillwater drainage. Genetic conservation principles will guide our population reestablishment efforts.

2.6.3 Method of Fish Removal

The chemical proposed for removal of fish uses rotenone as its active agent. Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Rotenone has been used by native people for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s.

2.6.4 How Does It Work?

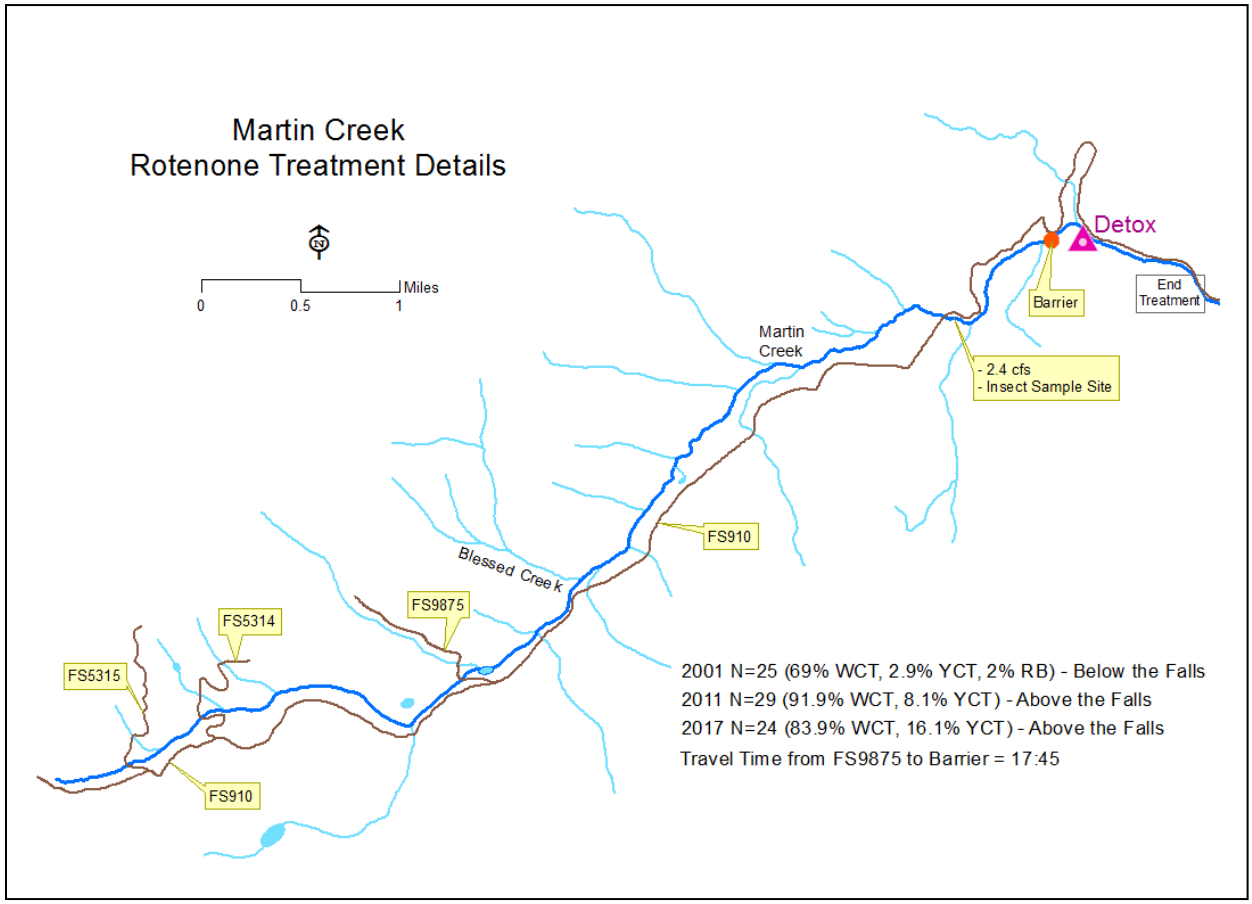
Rotenone is applied to the water and enters the fish through the gills. It is effective at very low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals, birds and other non-gill breathing organisms do not have this rapid absorption route into the bloodstream and are not affected by consuming treated water or dead fish at concentrations used in fisheries management. Rotenone kills fish by interrupting the Krebs Cycle in individual cells.

2.6.5 Treatment Area

The treatment area encompasses the upper most extent of flowing water in Martin Creek. The bottom end of the treatment is the natural barrier falls, with a 30-minute contact zone below the

detox at the falls. The treatment area is approximately 5 miles and runs along FS road #910. The upper most extent of the treatment zone is where FS road 5315 crosses Martin Creek (Figure 4).

Error! Reference source not found.. **Martin Creek Treatment area with locations of sampling events and associated data. Data from Genetic sampling shows date and SNP results.**



Waters within the project area would be treated with CFT Legumine fish toxicant. We would follow the label recommendations, which is typically within the range of 0.5 and 1.0 ppm. The exact concentration of the selected formulation will be determined in the field by conducting bioassays on caged fish, with the intent of determining the lowest dose that will meet the project objective of eradication of fish in the project area.

Access to the treatment area will be closed during the application of rotenone. Signs will be placed one day before the treatment at public access points, trail and road crossings and other avenues where access to the treatment area can be readily obtained. Signs will be removed once the application is complete.

2.6.6 Method of Application

The primary means of delivering the CFT Legumine solution to streams would be the use of drip stations in accordance with all established label guidelines. Drip stations are containers that administer diluted rotenone to the stream at a constant rate. These drip stations will administer rotenone to the stream for 8 hours. Backpack sprayers will spray the upstream ephemeral area according to CFT label specifications. A bioassay would allow calculation of the lowest effective dose of rotenone for the project waters. The concentration of CFT Legumine in drip stations would likely be in the range of 0.5 to 1.0 ppm. Once diluted in the stream, the concentration of rotenone would be 25 to 50 ppb, which is roughly equal to ¼ to ½ - grains of table salt per liter. The drip station releases a thin stream of the diluted CFT Legumine, and runs at least for 8 hours. Pisicide applicators using backpack sprayers would apply the same concentration of CFT Legumine to off-channel waters, such as wetlands and isolated pools. Dye tests have indicated a travel time of approximately 17 hours and 45 minutes through the treatment area, which allows us 13 drip stations for the entire treatment area. Approximate calculations show we will apply no more than 6 gallons of CFT Legumine, but exact calculations will be made the day of the treatment by taking flow measurements at each drip station.

Treatment would last for approximately 8 hours. When the stream treatment ends, freshwater would dilute rotenone, contributing to its degradation. The deactivation station would run for up to another 36 hours, see deactivation section below. The theoretical travel time through the treatment area is approximately 17 hours and 45 minutes.

2.6.7 Deactivation

Treating the streams in this watershed would take an estimated 2 days: 1 day for the application of rotenone and 2 days for the deactivation. Potassium permanganate ($KMnO_4$) is a strong oxidizer that when applied to water readily neutralizes rotenone. Potassium permanganate would be used as the deactivation agent and applied in the dry granular form via an auger dispensing system. The deactivation station would be located at the lower end of the rotenone treatment area, and the deactivation zone extending downstream 30 minutes travel time from the station. Deactivation would begin immediately as the rotenone application begins and terminated only when the last of the rotenone has theoretically passed deactivation station (calculated as the time of last application of rotenone plus the approximately 17 hours and 45 minutes travel time to reach the deactivation station) and all sentinel fish immediately above the deactivation station survive an additional 4 hours without stress. It is required per the FWP's piscicide policy (2012) that a block net would be installed at the end of the deactivation zone to prevent dead fish from drifting downstream of the project area.

2.6.8 Fate of Dead Fish

Dead fish that surface would be gathered and placed at the bottom of stream pools to reduce the risk of them becoming an attractant to birds, bears, dogs, otters, and mink. Dead fish naturally

decay within a few days and provide nutrients to the stream that aid in native fish community establishment.

2.6.9 Duration of project

If all the fish are not removed during the first treatment, it may be necessary to implement additional treatments to achieve the desired objectives. The metrics we would use to determine success include collecting eDNA samples from the treated water and stream electrofishing. See comment 5b about monitoring fish. Because of the complexity of stream systems, complete eradication of target fish species is rarely achieved with one treatment. If the objectives of the project were not met after the first treatment, a second or third treatment may be conducted the following year to fulfill the objectives.

2.6.9 Monitoring

Recovery of benthic macroinvertebrate species will be evaluated over two successive years by collecting samples in three sites in the treatment area, one in the deactivation zone, and one in a control (untreated nearby stream).

The stream would be restocked with fish in the summer of 2021. The source for genetically pure Westslope Cutthroat Trout will be Sheppard Creek and/or other streams in the Stillwater River drainage. In order to monitor long-term effects of this project, FWP will establish 2-3 electrofishing monitoring sites. Population estimates will be calculated on a periodic basis and compared to neighboring streams of equal size. Additional genetic monitoring will be conducted at five-year intervals after establishment of the new population and compared to the genetic structure of donor populations. If genetic indices such as allelic richness decline, additional supplementation may be necessary in the future. Finally, donor populations will be monitored closely to ensure that removal of WCT does not impact genetic diversity or hasten the shift towards non-native species composition. To minimize impacts to donor populations, no more than 25% of the estimated linear abundance should be removed from the population.

3 Environmental Review

3.1 *Physical Environment*

3.1.1 Land Resources

LAND RESOURCES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Soil instability or changes in geologic substructure?		X				

b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

3.1.2 Water

WATER **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		yes	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		yes	see 2a 2f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X	X			See 2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				

l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		YES	2m

Comment 2a

The proposed project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short term and minor. CFT Legumine 5% liquid rotenone are EPA registered pesticide and are safe to use for removal of unwanted fish, when handled properly. The concentration of CFT Legumine 5% liquid proposed is 1 ppm in water but could be adjusted within the label-allowed limits based upon the results of on-site assays.

We expect the stream to detoxify within 18 hours after application of CFT Legumine has started. We are confident of this timeframe because of our extensive dye tests that revealed a travel time of 17 hours and 45 minutes through the treatment zone. The rotenone labels and FWP policy require deactivation with potassium permanganate to prevent toxic levels of rotenone from flowing away from the treatment area.

Several factors influence rotenone's persistence and toxicity. Warmer water temperatures promote deactivation. Rotenone has a half-life of 14 hours at 24 °C, and 84 hours at 0 °C (Gilderhus et al. 1986, 1988), meaning that half of the rotenone is deactivated and is no longer toxic in that time. As temperature and sunlight increase, so does deactivation of rotenone. Higher alkalinity (>170 mg/L) and pH (>9.0) also increase the rate of deactivation. Rotenone tends to bind to, and react with, organic molecules, and availability of organic matter substantially decreases the persistence of rotenone (Dawson et al. 1991). Dilution from groundwater inputs or tributary streams also contributes to deactivation of rotenone.

FWP's piscicide policy requires deactivation of rotenone in streams and lake outflows using potassium permanganate ($KMnO_4$), a strong oxidizer, to minimize exposure beyond the treatment area unless the stream goes dry at the downstream end of the treatment area and there are no associated groundwater concerns. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the rotenone (2-4 ppm). Deactivation is accomplished after about 15-30 minutes of exposure time between the two compounds.

To achieve full neutralization, potassium permanganate must be continuously delivered at a rate such that a residual level of potassium permanganate of 0. 5-1.0 ppm is maintained downstream of the application the distance the water flows in 30 minutes. This distance is known as the neutralization or deactivation zone. A chlorine meter would be used to monitor the presence of

potassium permanganate at the end of the 30-minute contact zone to ensure that 0. 5-1. 0 ppm potassium permanganate is present and that the rotenone is completely neutralized. In addition to direct measurement of the potassium permanganate in the water, caged fish (Rainbow x Cutthroat hybrid that will be electroshocked from the stream) would be placed in the stream to monitor the effectiveness of the detoxification station during the treatment. Caged fish would be placed downstream of the 30-minute contact zone and monitored. Distress or the lack thereof in these caged fish indicates whether neutralizing is effective. Application of potassium permanganate would continue until the theoretical time in which all treated waters have passed the fish barrier and caged fish placed immediately upstream of the neutralization zone can survive for an additional 4 hours (for additional information on see comment 2a below).

Below is the detox plan from the piscicide policy.

Single-day treatments

- **Stream treatments**
  - Step 1: Sentinel fish must be placed immediately above the detox station.
  - Step 2: Start potassium permanganate application 2 hours before the theoretical arrival time of the rotenone.
  - Step 3: potassium permanganate must be applied until the last of the rotenone has theoretically passed the detox station (calculated as the time of last application of rotenone plus the travel time to reach detox station), and then stopped only after all sentinel fish immediately above the detox station survive an additional 4 hours without stress. "Last application" in this case means the last time rotenone from any drip station or backpack sprayer hits the water.

Comment 2f

No contamination of groundwater is anticipated to result from this project. Because ground water leaving Martin Creek must travel through bed sediments, soil, and gravel, and rotenone is known to bind readily with these substances, we do not anticipate any contamination of ground water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves only one inch in most soil types; the only exception would be sandy soils where movement is about three inches (Hisata 2002). In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, or any of the other organic compounds in the formulated products (CDFG 1994).

Case studies in Montana have concluded that rotenone movement through groundwater does not occur (FWP unpublished data). For example, at Tetrault Lake, Montana neither rotenone nor inert ingredients were detected in a nearby domestic well, which was sampled two and four weeks after applying 1.8 ppm rotenone to the lake. This well was chosen because it was down gradient from the lake and drew water from the same aquifer that fed and drained the lake. FWP has sampled wells and groundwater in several piscicide projects that removed fish from ponds, and no rotenone, or the inert ingredients of the selected formulation were detected in ponds ranging from 65 to 200 feet from the treated waters. Likewise, application of piscicide to streams has not resulted in contamination of neighboring wells or groundwater. In 2015 and 2016, Soda Butte Creek flowing through Cooke City and Silver Gate, Montana was treated with CFT Legumine. Wells drawing water from the same open aquifer as the treated stream were sampled during and after the treatment and all found to be free of rotenone.

Comment 2j

The CFT Legumine label states… "Do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of an irrigation water intake in a standing body of water such as a lake, pond, or reservoir. For applications > 40 ppb or 0.04 ppm active rotenone (> 0. 8 ppm 5 % rotenone formulation) in waters with drinking water intakes or hydrologic connections to wells, 7 to 14 days before application, the certified applicator or designee under his/her direct supervision must notify the party responsible for the public water supply, or individual private water users, to avoid consumption of treated water until: (1) active rotenone is < 0. 04 ppm as determined by analytical chemistry, (2) fish of the *Salmonidae* or *Centrarchidae* families can survive for 24 hours, (3) dilution with untreated water yields a calculation that active rotenone is < 0. 04 ppm, or (4) distance or travel time from the application sites demonstrates that active rotenone is < 0. 04 ppm."

There are no irrigation diversions or potable water wells located within the proposed treatment areas of upper Martin Creek. Impacts to irrigation and potable water intakes would be short term and minor and would be mitigated by the following action. We purposely are treating the upper watershed of Martin Creek to not impact wells of downstream landowners. The closest land owner to the lower most section of the treatment zone (i.e. Martin Falls) is 3.9 miles downstream.

Comment 2m

The 2016 Pesticide General Permit issued on a five-year cycle by Montana DEQ provides the authority for FWP to apply piscicides. FWP, and any other piscicide applicator, must develop a pesticide discharge management plan as a condition for coverage under this permit. For FWP, the plan consists of procedures and protocols developed by and detailed in FWP's Piscicide

Policy, the AFS Rotenone Standard Operating Procedures manual, and annual training and critique of projects provided by the FWP Piscicide Committee.

3.1.3 Air

AIR **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 (c))			X			
b. Creation of objectionable odors?			X		yes	3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge which will conflict with federal or state air quality regulations?		X				

Comment 3b

CFT Legumine does not contain the same level of aromatic petroleum solvents (toluene, xylene, benzene and naphthalene) of other rotenone formulations and consequently does not have the same odor concerns.

Dead fish would result from this project and may cause objectionable odors (2.6.8).

Vegetation 3.1.4

VEGETATION **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**

a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?			X			4c
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a

There would be some trampling of vegetation along the stream during the placement and monitoring of drip stations and sentinel fish locations. Rotenone does not affect plants at concentrations used to kill fish. Impacts from trampling vegetation are expected to be short term and minor and should be fully healed within 1 growing season.

Comment 4c. Rotenone has no impacts on plant species at fish killing concentrations. The only anticipated impacts to sensitive plant species would be a result of trampling by the personnel applying the rotenone to the stream and any impacts from trampling are expected to be short term and minor. Any trampling impacts should be fully healed within 1 growing season. Impacts to sensitive plants can be minimized by staying as much as possible on existing road and trail systems.

3.1.4 Fish/Wildlife

FISH/WILDLIFE **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		yes	5b
c. Changes in the diversity or abundance of nongame species?			X		yes	5c

d. Introduction of new species into an area?			X			5d
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				5g
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)			X			See 5d

Comment 5b

This project is intended to remove hybridized cutthroat trout from Martin Creek. These fish were stocked between 1938 and 1950 to establish a sport fishery. Cutthroat trout are a gamefish. Impacts to the sport fishery would be short term. Westslope Cutthroat trout would be stocked the following year and the fishery would be quickly reestablished.

Comment 5c

Non-game non-target species that could be impacted are included below.

Mammals

Ingestion of rotenone, either from drinking rotenone-treated water or from consuming dead fish or invertebrates from rotenone-treated streams, are the likely routes of exposure for mammals. A substantial body of research has investigated the effects of ingested rotenone in terms of acute and chronic toxicity and other potential health effects. In general, mammals are not affected by rotenone at concentrations used to kill fish. Consuming treated water or rotenone killed fish does not affect mammals at fish killing concentrations because rotenone is neutralized by enzymatic action in their stomach and intestines (AFS 2002). Investigations examining the potential for acute toxicity from ingesting rotenone find that mammals would need to consume impossibly high amounts of rotenone-treated water or rotenone-killed fish to obtain a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours or eat 660,000 pounds of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). A half-pound mammal would need to consume 12.5 mg of pure rotenone or drink 66 gallons of treated water for a lethal dose (Bradbury 1986). The effective concentration of

rotenone to kill fish is 0.5 to 1.0 ppm, which is several orders of magnitude lower than concentrations that result in acute toxicity to mammals. Evaluations of mammals' potential exposure to rotenone from scavenging indicate that acute toxicity from ingesting rotenone-killed fish is highly unlikely (EPA 2007).

Chronic toxicity associated with availability of dead fish over time would not pose a threat to mammals, nor would other health effects be likely. Rats and dogs fed high levels of rotenone for 6 months to 2 years experienced only diarrhea, decreased appetite, and weight loss (Marking 1988). The unusually high treatment concentrations did not cause tumors or reproductive problems. Toxicology studies investigating potential secondary effects of rotenone exposure have found no evidence that it results in birth defects (HRI 1982), gene mutations (BRL 1982; Van Geothem et al. 1981), or cancer (Marking 1988). Rats fed diets laced with 10 to 1000 ppm of rotenone over a 10-day period did not experience any reproductive dysfunction (Spencer and Sing 1982). Therefore, chronic exposure to rotenone poses no threat to mammals consuming dead fish or treated water. Rotenone does not persist in the environment which also limits the chronic exposure to mammals or other terrestrial organisms. In Martin Creek, rotenone is only expected to persist for 17 hours 45 minutes, so chronic exposure to mammals is unlikely..

A temporary reduction in prey of aquatic origin has the potential to influence some mammals. The American mink is a piscivorous mammalian that is most likely to occur in the project area. Mink are opportunistic predators and scavengers, with fish and invertebrates comprising a portion of their diet. Therefore, the reduction in density of fish following treatment may displace mink to adjacent, untreated reaches until fish populations recover. Nonetheless, as opportunists, American mink have flexibility to switch to other prey species and have the ability to disperse.

Other mammalian predators may experience short-term and minor consequences. Opportunistic black bears (*Ursus americanus*), raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), otters (*Lontra canadensis*), and striped skunks (*Mephitis mephitis*) would likely consume dead fish immediately after piscicide treatment. The temporary reductions of aquatic prey, and the brief availability of dead fish, constitute short-term and minor effects on mammalian predators and scavengers. Dead fish will be removed from the treatment zone and downstream of the detox site.

Birds

Birds have the potential to be exposed to rotenone through ingestion of treated water or scavenging dead fish and invertebrates. Like with mammals, rotenone breaks down rapidly within the gut of birds. Moreover, the concentrations of rotenone in waters treated for fisheries management are far below levels found to be toxic to birds. For example, ¼-pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates, within 24 hours, for a lethal dose (Finlayson et al. 2000). The EPA concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to

wildlife (EPA 2007). In summary, this project would have no adverse effect birds that ingest water, dead fish, or dead invertebrates.

Numerous bird species rely on prey of aquatic origin, and a rotenone project has potential to temporarily decrease forage availability. Timing the project for when neotropical migrant songbirds are migrating south mitigates for loss of forage base. Like mammals, birds are highly mobile, so the project may result in short-term displacement of birds that consume fish or aquatic invertebrates.

Reptiles

Reptiles, especially garter snakes, have potential to be exposed to rotenone treated water and could scavenge dead fish. The low concentration of rotenone in water and dead fish indicates reptiles would not experience toxic exposure to rotenone. Moreover, the reptilian gut is likely as efficient, or more efficient, at breaking down rotenone given the ability of reptiles to digest bone, hair, and exoskeletons, all of which are far less degradable than the rotenone molecule.

Amphibians

Amphibians are closely associated with water and have potential to be exposed to rotenone during treatment. In general, adult, air-breathing amphibians are not affected by rotenone at fish killing concentrations (Chandler and Marking 1982, Grisak et al. (2007) but the larvae would likely be affected (Grisak et al 2007, Billman et al 2011). Billman et al. (2011) conducted laboratory toxicity tests of the impacts of rotenone on Columbia spotted frogs and Boreal toads. They found significant mortality to the larval stages of both species if they are exposed for 96 hours to 1 ppm CFT Legumine, but the mortality was less when exposed to lower dosages (0.5 ppm) or for a shorter duration (4 hours or less). In Yellowstone Park rotenone caused nearly 100% mortality in gill-breathing, amphibian tadpoles within 24 hours, but did not affect non-gill breathing metamorphs, juveniles, or adults. In the year(s) following, tadpole repopulation occurred at all water bodies treated with CFT Legumine and population levels were similar to or higher than, pre-treatment levels (Billman et al. 2012). Olsen (2017) found that a concentration of 1 ppm rotenone in the West Fork of Mudd Creek produced 100% mortality of tailed frog tadpoles, but concentrations of 0.75, 0.5 and 0.25 mortality averaged only 33%. To mitigate for the potential impacts to larval stages of amphibians, applications can be performed later in the year when the larvae are not present, such as the fall, for shorter duration (4 hours) or at a lesser concentration. The Martin Creek treatment will occur late in the fall, drip stations will run approximately 4 hours, and a concentration of less than 1ppm may be used.

Below is a list of amphibians native to northwest Montana that need to be considered before rotenone application in Martin Creek (**Error! Not a valid bookmark self-reference.**). MFWP surveys have not documented amphibians in the main channel of Martin Creek. During a 2018 survey of a small pond 200m away from Martin Creek the field crew observed 3 larval long-toed salamanders, 3 adult and 8 larval Columbia spotted frogs.

Table 2. Amphibians with potential to be exposed to rotenone in Martin Creek (from Montana Natural Heritage Program).

Order	Common Name	Scientific Name	Gilled Phase Coincide with late summer/early fall piscicide treatment	Status
Caudata/ salamanders	Long-toed salamander	*Ambystoma macrodactylum*	No	G5, S4
Anura/toads and frogs	Rocky Mountain tailed frog	*Ascaphus montanus*	Yes	G4, S4
	Columbia spotted frog	*Rana luteiventris*	Yes, at higher elevations	G4, S4
	Western toad	*Anaxyrus boreas*	Yes	G4, S2, sensitive (USFS and BLM)

S2 = In Montana, at risk due to very limited and/or potentially declining population numbers, range and/or habitat, making vulnerable to extirpation.
G4 = Globally, is apparently secure, although it may be rare in parts of its range, and/or suspected to be declining.
G5 = Globally, the species is common, widespread, and abundant, although it may be rare in parts of its range. The species is not vulnerable in most of its range.
S4 = In Montana, the species is apparently secure, although it may be rare in parts of its range, and/or suspected to be declining.

Long-toed salamanders occupy portions of western Montana east and west of the Continental Divide. This species is unlikely to experience long-term population effects of piscicide treatment. Long-toed salamanders usually lay eggs in fishless ponds or lakes, which would not be treated with rotenone. Even so, larval long-toed salamanders were 5 times more tolerant to Prenfish, a formulation of rotenone using organic solvents and dispersants, than fish, and adult long-toed salamanders survived 96-hour exposure to treatment concentrations of Prenfish used in piscicide projects (Grisak et al. 2007). Adult long-toed salamanders are terrestrial and breed immediately after snowmelt. Larval forms would not be present for fall application of piscicide. The combination of preference for fishless lakes for breeding and terrestrial existence as adults make long-toed salamanders unlikely to be affected by piscicide treatments. In cases where this

species breeds in fish-bearing lakes, piscicide treatment may result in the loss or reduction of a year class; however, breeding in following seasons would allow the population to recover. This species was observed breeding in a pond adjacent to Martin Creek. Ponded areas next to the main channel will not be treated with rotenone during this project.

Western toads show the same life stage sensitivity to rotenone, with tadpoles suffering near total mortality to exposure to concentrations of rotenone used in current practice, but show resilience to rotenone as metamorphs through adults (Billman et al. 2011). Moreover, adult western toads are likely less sensitive than frogs, given their impermeable skin (Maxell and Hokit 1999). Likewise, adult toads and frogs can leave the aquatic environment, which substantially reduces the potential for exposure (Maxell and Hokit 1999). Western toads have various characteristics that make them resilient to piscicide projects. Western toads have exceptional fecundity, documentation of egg clutches averaging 5,000 in Colorado, and reaching 16,000 in Montana and 20,000 in the Pacific Northwest. Development from hatching to metamorphosis is related to temperature and can be rapid; however, populations at tree line may fail to metamorphose, and these populations may rely on immigration from lower elevations to persist. It is possible this species inhabits Martin Creek, MFWP surveys have not discovered them.

Rocky Mountain tailed frogs are the most tied to water of all the frogs and would likely experience short-term and minor effects from treatment with rotenone. Their reproductive strategy is to mate in August to September and store the sperm overwinter. Eggs are oviposited the next spring, and metamorphosis occurs up to 4 years later. Therefore, at least 1-year class of tadpoles would be exposed to rotenone, with 2 or more exposures being possible. Nevertheless, their life history strategies make Rocky Mountain tailed frogs resilient to rotenone treatment. Rocky Mountain tailed frogs are a long-lived species, and do not reach reproductive maturity until age 7 or 8. This species would be resilient to rotenone treatment because many older year classes would survive, and treatment concentrations of rotenone do not have an adverse effect on adults (Grisak et al. 2007). In addition, Rocky Mountain tailed frog tadpoles experienced 100% mortality to 1 ppm rotenone; however, with concentrations of 0. 75, 0. 5, and 0. 25 ppm mortality averaged 33% (Olsen 2017). Larger tadpoles were more resilient. While it is possible these frogs inhabit Martin Creek, MFWP surveys have not discovered them.

Columbia spotted frogs typically deposit their eggs in shallow water containing emergent vegetation from mid-April to early June. Complete metamorphosis occurs within 8-16 weeks (Werner et al. 2004). Columbia spotted frogs that have reached a lung-breathing life stage do not suffer an acute response to trout-killing concentrations of piscicides (Grisak et al. 2007). However, piscicide treatments are acutely toxic during the gill-breathing life stage as tadpoles (Billman et al. 2011). Because of this, piscicide treatments are increasingly being implemented late in the fall to reduce exposure to the gill-breathing life stage. The most vulnerable populations of Columbia spotted frogs are those at tree-line, or elevations above 6,500 to 7,000

feet. These populations are temperature limited and will remain as gilled tadpoles throughout the winter (Bryce Maxell, Montana Natural Heritage Program, personal communication). This species was observed breeding in a pond adjacent to Martin Creek. Ponded areas next to the main channel will not be treated with rotenone during this project. Like gill-bearing aquatic macroinvertebrates, frog and toad larvae are sensitive to rotenone, and exposure to rotenone at levels used to kill fish is acutely toxic to Columbia spotted frog, Rocky Mountain tailed frog, and western toad larvae (Grisak et al. 2007; Billman et al. 2012). Although tadpoles may be vulnerable to rotenone, at least some species may be up to 10 times more tolerant than fish (Chandler and Marking 1982). Treatment in late summer or early fall is a recommended practice to prevent effects on frogs and toads, as many are past the gilled life history stage (Grisak et al. 2007). In the short-term, this practice may not be protective of species that remain as gilled larvae for more than 1 year, or at high elevations, where delay in the breeding season and low temperatures delay metamorphosis. Nevertheless, toads and frogs have considerable potential to recover from this short-term disturbance.

Variability of tolerance to rotenone among species of toads and frogs is unknown; however, evidence for resiliency to rotenone of some species suggests a general tolerance is possible. A study in Norway examined the response of lake-dwelling amphibians, the common frog (*Rana temoraria*) and common toad (*Bufo bufo*), to treatment with CFT Legumine (Amekleiv et al. 2015). These species were observed before and 1 year after treatment with rotenone, with adults, eggs, and tadpoles being present following treatment. They concluded CFT Legumine had little effect on these species. A field study among several alpine lakes in northwest Montana reported similar detection frequencies before and after lake treatments for Columbia spotted frogs, long-toed salamanders, western toads, and adult Rocky Mountain tailed frogs (Fried et al. 2018).

Stream-Dwelling Aquatic Invertebrates

Investigations into the effects of rotenone on benthic organisms indicate that rotenone can result in temporary reduction of gilled aquatic invertebrates. Invertebrates that were most sensitive to rotenone also tended to have the highest rate of recolonization due to short life cycles (Engstrom-Heg et al. 1978). Although gill-respiring invertebrates are a sensitive group, many are far less sensitive to rotenone than fish (Schnick 1974; Chandler and Marking 1982; Finlayson et al. 2010). Due to their short life cycles (Anderson and Wallace 1984), strong dispersal ability (Pennack 1989), and generally high reproductive potential (Anderson and Wallace 1984), aquatic invertebrates are capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et al. 1996). Following a piscicide treatment of a California stream, macroinvertebrates experienced a resurgence in numbers, with black fly larvae recovering first, followed by mayflies and caddisflies within six weeks after treatment (Cook and Moore 1969). Stoneflies returned to pretreatment abundances by the following spring. Studies suggesting long-term reductions in

biomass and presumed absence of species following piscicide treatment examined treatments with markedly higher concentrations and durations of piscicide exposure, with a subsequent treatment occurring within a month of the first treatment (Mangum and Madrigal 1998).

A study of response of benthic invertebrates in streams in Montana and New Mexico used a concentration and duration of CFT Legumine similar to the one that is proposed in this project (Skorupski 2011). In Cherry Creek and Specimen Creek, both in Montana, rotenone resulted in minimal effects on macroinvertebrates immediately after. Rotenone had a greater effect on benthos in streams in New Mexico. Regardless of the initial response, invertebrate communities recovered in all streams within a year. In Norway CFT Legumine was applied at of 0.5 ppm, which is lower than the 1 ppm typical of most piscicide projects in Montana and despite initial reductions in invertebrate abundance, most taxa had recolonized with a year (KJærstad et al. 2014).

Because piscicides have the potential to alter abundance and species composition of aquatic benthic macroinvertebrates (BMI) over the short-term, FWP's Piscicide Policy requires pretreatment sampling of BMI (FWP 2012). To date, pretreatment temporal sampling has been conducted within the proposed treatment area in July, August and September for years 2018 and 2109 Temporal pretreatment sampling within the treatment area and a control location is scheduled for 2020. Thus far, pretreatment sampling protocol is in accordance with Sample Category 1 described below. Sampling gear used for pretreatment BMI monitoring is a 1 square foot Surber Sampler and the sample size is 2 ft^2 from 3 riffle habitats. No BMI species of concern (SOC) with the state ranking of S1 or S2 have been observed within the treatment area. Post-treatment monitoring will also be conducted to quantify impacts to BMI with the sampling protocol and intensity being dependent on the presence of SOC's and/or the controversy of the project. If during the initial review of the MNHP list, a BMI species with a state ranking S1 (at high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state) or S2 (At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state) has been observed within the drainage targeted for piscicide treatment, SOC-appropriate field sampling will be conducted. Results will be included in the EA.

The possibility of eliminating a rare or endangered species of aquatic invertebrate in the proposed streams by treating with rotenone is unlikely. During the initial information gathering phase for this document the Montana Natural Heritage Program (MNHP) was consulted to determine if there were non-target aquatic species of concern (SOC) present in the treatment area (http://mtnhp. org/SpeciesOfConcern/?AorP=a).

The table below is a list of BMI species that may be present within the treatment area that may be impacted.

Species Subgroup	Species Section	Scientific Name	Common Name	Family Name	SOC Rank
Insect	Caddisflies	Rhyacophila ebria	Rhyacophilan Caddisfly	Rhyacophilidae	S1
Insect	Caddisflies	Rhyacophila gemona	Rhyacophilan Caddisfly	Rhyacophilidae	S2
Insect	Caddisflies	Rhyacophila glaciera	Rhyacophilan Caddisfly	Rhyacophilidae	S1
Insect	Caddisflies	Rhyacophila potteri	Rhyacophilan Caddisfly	Rhyacophilidae	S2
Insect	Caddisflies	Rhyacophila rickeri	Rhyacophilan Caddisfly	Rhyacophilidae	S2
Insect	Damselflies	Coenagrion interrogatum	Subarctic Bluet	Coenagrionidae	S1S2
Insect	Dragonflies	Aeshna subarctica	Subarctic Darner	Aeshnidae	S1S2
Insect	Dragonflies	Somatochlora walshii	Brush-tipped Emerald	Corduliidae	S1S2
Insect	Mayflies	Parameletus columbiae	Mayfly	Siphlonuridae	S1
Insect	Stoneflies	Isocapnia crinita	Hooked Snowfly	Capniidae	S2
Insect	Stoneflies	Isocapnia integra	Alberta Snowfly	Capniidae	S2
Insect	Stoneflies	Isoperla petersoni	Springs Stripetail	Perlodidae	S2
Insect	Stoneflies	Soyedina potteri	Northern Rocky Mountains Refugium Stonefly	Nemouridae	S2
Insect	Stoneflies	Utacapnia columbiana	Columbian Snowfly	Capniidae	S2
Insect	Stoneflies	Zapada cordillera	Cordilleran Forestfly	Nemouridae	S2
Insect	Stoneflies	Zapada glacier	Western Glacier Stonefly	Nemouridae	S1
Mollusk		Margaritifera falcata	Western Pearlshell	Margaritiferidae	S2

Sampling protocols for BMI will fall into one of three sampling categories as described below (language from policy).

> **Category 1**: This category is intended to be used in situations where S1/S2 species **are not** present, no controversy is expected, and simply provides some basic indication that populations rebound.

Category 2: This category is intended to be used in situations where S1/S2 species **are** present or where concern has been raised about the impacts to BMI, the impacts of diminished BMI on fish after restocking, or additional research needs are determined.

Category 3: This category is intended to be used where legal or regulatory action has been threatened regarding the impacts to BMI, or when the goal is to statistically validate impacts.

The Decision Tree for Benthic Macroinvertebrate Sampling (Flowchart 1.0) will assist in determining the correct sampling category for your treatment area. The sampling procedures table below describes recommended sample gear, sampling conditions and metrics.

Collection Methods: Site selection, equipment, preservation and sample containers, and other general guidance should be conducted according to the 2012 DEQ guidance *Sample Collection, Sorting, and Taxonomic Identification of Benthic Macroinvertebrates* (or most current version). One person should be used to do all the taxonomic identifications for each project to ensure standardization.

Benthic macroinvertebrate sampling procedures and protocols (see Section 5)

Category	Sample locations	Sample dates	Sample gear, sample size	Metrics
1	Control & Treatment area (Same stream)	--Preferably 1-year, minimum (no more than) 1 month before treatment --1-year post-treatment	Travelling kick (1 sample within each of 3 sites in Treatment area and 1 sample at 1 Control Site)	--Taxa richness --EPT indices (% EPT) --CPUE Identify to lowest practical taxonomic level
2	Control, Treatment area, Detox zone (same stream)	--1-year pre-treatment and (no more than) 1-month pre-treatment treatment --At a minimum, 1-month post-treatment, pre-runoff the following spring, and 1-year post-treatment.	Use current MTDEQ (EMAP) sampling and analysis protocols**,** including 3 sites in Treatment area, Control Site and Detox zone	--Taxa richness --EPT indices (%EPT) --CPUE from travelling kick, density estimates from Hess/Surber --Functional metric (% predator) --Habit metric (% burrower) -- Composition metric (%EPT, % non-insects) --Richness metrics (E taxa, P taxa)

				Build a reference collection, have an independent taxonomist identify 10% subset of samples for QA purposes, and identify to lowest practical taxonomic level
3	Control, Treatment area, Detox zone (same stream); Control (neighboring untreated stream subject to similar habitat, elevation, flow regime, weather, etc)	Multiple-previous year (multi-season) sampling and multiple post-year (multi-season) sampling	Use current MTDEQ (EMAP) sampling and analysis protocols designed to achieve some statistical level of significance (QA/QC)	Consult with taxonomist for relevant metrics and indices relevant to site and Treatment conditions Build a reference collection, have independent taxonomists identify all samples (including the 10% subset of samples), and identify to lowest practical taxonomic level.

Mussels and Clams

Freshwater mussels tend to have a much higher tolerance to rotenone than fish or other aquatic invertebrates (Hart et al. 2001). Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation). Dolmen et al. (1995) found that pearl mussels exposed in a field experiment to 5 ppm rotenone for 12 hours experience no mortality. In laboratory experiments these same authors determined the upper lethal limit for pearl mussels was 30-40 ppm rotenone which is more than 30 times the application rate for the proposed project. Experiments were conducted in the West Fork Mudd Creek in the Big Hole River drainage in 2013 on western pearlshell mussels. The results of these experiments indicated that rotenone applied to a stream at a concentration of 1 ppm for 4 hours had no acute effect on mussel mortality 24 or 72 hours after exposure (Olsen 2017).

Comment 5d

Fish

Rotenone is highly toxic to fish, and an objective of this project is full eradication of hybridized cutthroat trout. This project is designed to restore WCT to Martin Creek, located within the historic range of WCT. This project will be beneficial to WCT, which will contribute to native species conservation.

We will restock waters with local source stock WCT from Sheppard creek located in the Stillwater drainage. Sheppard creek contains a genetically pure population of WCT and has been

tested for aquatic diseases and AIS by FWP staff in 2018. We plan to direct transfer 50-80 WCT annually from Sheppard creek beginning in 2021. We plan to wait till 2021 to give the aquatic food web recovery time from the rotenone treatment. We will translocate WCT from Sheppard creek till 2023, or until the population is healthy and abundant. We will supplement the translocation effort with other genetically pure and disease free WCT from the Stillwater drainage if the population in Sheppard creek is not abundant enough to sustain the translocation. Locations for other candidate WCT translocation populations will be determined through ongoing backpack electrofishing surveys in the Stillwater drainage. We will also use Sekokini Springs conservation rearing facility to supplement local sources of WCT populations if translocations efforts are not sufficient.

Comment 5f

Grizzly bears are known to be in this area but are not dependent on the creek or fish in the creek for food. The infrequent sighting of grizzly bears, human activity in the area and removing dead fish from the site would contribute to reducing potential for this species to consume rotenone killed fish. The project would not have an impact on grizzly bears.

The project site is within the range of the gray wolf. Various packs may use this area at times but are not dependent on the creek or fish in the creek for food. The impacts to this species would be non-existent for the same reasons as the grizzly bear.

The project location is within the range of the threatened Canada lynx. While this species may travel through the area they are not dependent on aquatic habitat, or using fish as a food source, therefore this project would not have an impact on this species.

On July 21, 2006 FWP contacted the US Fish and Wildlife Service to determine if the department needed to consult with the Service about T&E species in the project area. FWP determined that there would be "no effect" to T&E species, so no formal consultation with the Service is necessary.

3.2 *Human Environment*

3.2.1 Noise/Electrical Effects

6. NOISE/ELECTRICAL EFFECTS **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Increases in existing noise levels?			X			6a
b. Exposure of people to serve or nuisance noise levels?		X				

c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Comment 6a

Martin Creek is located close to the town of Olney and is very near an active rail line and highway. The only noise generated from this project would be from a generator that will be used at the detox station but is consistent with present levels. The noise generated from this would be short term and minor.

3.2.2 Land Use

7. LAND USE **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?			X			7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c

During treatment with rotenone, public access to the project areas would be restricted for several days to prevent public exposure to rotenone. The length of the closure would depend on the amount of time the treated streams remained toxic to fish but would not exceed 3 days. The label for CFT Legumine states that detoxification should be terminated when replenished fish survive and show no signs of stress for at least four hours. FWP expects the treated waters to be non-toxic to fish within 24-48 hours after application of rotenone. Therefore, it can reasonably be expected that any closures would last 2 to 3 days total. The treatment would be implemented in late summer (August). At proposed treatment levels, stream water would not be toxic to wildlife or livestock.

Cumulative Impacts: Impacts on land use from the proposed action would be short term and minor. FWP does not expect the proposed action to result in other actions that would impact land use in the proposed restoration streams. FWP does not foresee any other activities in the basin that would add to impacts of the proposed action. As such there are no cumulative impacts related to land use from the proposed treatment of the proposed creek with piscicides.

3.2.3 Remove this index

3.2.4 Risks/Health Hazards

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		yes	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		yes	8b
c. Creation of any human health hazard or potential hazard?			X		yes	see 8a 8c
d. Will any chemical toxicants be used?			X		yes	see 8a

Comment 8a

The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment required by the product label and SDS sheets. All applicators would be trained on the safe handling and application of the piscicide and potassium permanganate. Piscicide applicators become certified applicators upon passing examinations given by the Montana Department of Agriculture. Beyond this, FWP imposes additional requirements on its own employees through its internal piscicide policy (FWP 2012). An independent certified applicator must accompany each treatment, with "independent" status assigned to an individual who would not be expected to work on the treatment as part of their normal duties. Therefore, at least 2 Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Materials would be transported, handled, applied and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b

FWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP the risk of emergency response is minimal and any effects to existing emergency responders would be short term and minor.

Comment 8c

Information examined here includes an analysis of human health risks relating to rotenone exposure (EPA 2007, Fisher 2007). Acute toxicity refers to the adverse effects of a substance from either a single exposure or multiple exposures in a short space of time. Rotenone ranks as having high acute toxicity through oral and inhalation routes of exposure, and low acute toxicity through exposure to skin (EPA 2007). Acute toxicity would be applicable to undiluted rotenone formulation, with median lethal doses for rats ranging from 39. 5 mg/kg for female rats, and 102 mg/kg for male rats. A rat would need to ingest or inhale 0.04 g of undiluted rotenone for a lethal dose. As rotenone is 5% of most rotenone formulations, a 1 kg rat would have to consume 0.63mL of formulation to receive a lethal dose. Because the treatment area would be closed to public access during rotenone application, exposure of humans to undiluted 5% rotenone formulation would not occur. Only personnel involved in the project who actively measure and are applying the chemical could be exposed. Oral or inhalation risks for these persons can be reduced or eliminated by proper use of personal protective equipment.

Chronic exposure is repeated oral, dermal, or inhalation of the target chemical (EPA 2007). In humans, chronic exposure is the length of time equivalent to approximately 10% of the life span. In piscicide treatments in streams, exposure to rotenone lasts at most 4 days. Therefore, the only people likely to experience chronic exposure are the applicators who dispense diluted CFT Legumine over multiple projects. The use of protective eyewear, gloves and dust/mist respirators (in the case of hand held devices that dispense rotenone) is sufficient to protect worker health.

The analysis of dietary risks considered threats to the subgroup “females 13-49 years old” and examined exposure associated with consuming exposed fish and drinking treated surface water (EPA 2007). In determining potential exposure from consuming fish, the EPA used maximum residues in fish tissue. The concentrations of residue considered were conservative, meaning that they may have been an overestimate of the rotenone concentrations in muscle tissue, as they included unpalatable tissues, where concentrations may be higher. The EPA concluded that acute dietary exposure estimates resulted in a dietary risk below the EPA’s level of concern;

therefore, consumption of fish killed by rotenone does not present an acute risk to the sensitive subgroup.

Table 3: Toxicological endpoints for rotenone (EPA 2007)

Exposure Scenario	**Dose Used in Risk Assessment, Uncertainty Factor (UF)**	**Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 aRfD = 15 mg/kg/day = 0. 015 mg/kg/day 1000	Acute PAD = 0. 015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies.		
Chronic Dietary (all populations)	NOAEL = 0. 375 mg/kg/day UF = 1000 cRfD = 0. 375 mg/kg/day = 0. 0004 mg/kg/day 1000	Chronic PAD = 0. 0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1. 9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0. 5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day
Inhalation Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification; No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

The EPA analysis of acute dietary risk for both food and drinking water concluded;

When rotenone is used in fish management applications, food exposure may occur when individuals catch and eat fish that either survived the treatment or were added to the water body (restocked) prior to complete degradation. Although exposure from this route is unlikely for the general U.S. population, some people might consume fish following a rotenone application. EPA used maximum residue values from a bioaccumulation study to estimate acute risk from consuming fish from treated water bodies. This estimate is considered conservative because the bioaccumulation study measured total residues in edible portions of fish including certain non-edible portions (skin, scales, and fins) where concentrations may be higher than edible portions (tissue) and the Agency assumed that 100% of fish consumption could come from rotenone exposed fish. In addition, fish are able to detect rotenone's presence in water and, when possible, attempt to avoid the chemical by moving from the treatment area. Thus, for partial kill uses, surviving fish are likely those that have intentionally minimized exposure.

Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater. The estimated drinking water concentration (EDWC) used in dietary exposure estimates was 200 ppb, the solubility limit of rotenone. The drinking water risk assessment is conservative because it assumes water is consumed immediately after treatment with no degradation and no water treatment prior to consumption.

Acute dietary exposure estimates result in dietary risk below the Agency's level of concern. Generally, EPA is concerned when risk estimates exceed 100% of the acute population adjusted dose (aPAD). The exposure for the "females 13-49 years old" subgroup (0.1117 mg/kg/day) utilized 74% of the aPAD (0.015 mg/kg/day) at the 95th percentile (see Table 5). It is appropriate to consider the 95th percentile because the analysis is deterministic and unrefined. Measures implemented as a result of this RED will further minimize potential dietary exposure (see Section IV).

As for evaluating the human chronic risk from exposure to rotenone treated water, the EPA acknowledges the four principle reasons for concluding there is a low risk. First, the rapid natural degradation of rotenone. Second, using active detoxification measures by applicators such as potassium permanganate. Next, properly following piscicide labels which prohibit the use near water intakes. Finally, proper signing, public notification or area closures which limit public exposure to rotenone treated water.

No recreational access (e.g., wading, swimming, boating, and fishing) would be allowed within the treatment area while rotenone is being applied. At applications rates less than 1.8 ppm there is no risk to human health after the chemical has been applied to the water and once the rotenone is mixed recreational access can be restored. At application rates greater than 1.8 ppm in streams recreational access can be can be removed 72 hours after application is complete. For lakes and

ponds where rotenone is applied at 1.8 ppm or more, recreational access can be restored following a 24-hour bioassay demonstrating survival of sentinel fish or 14 days, whichever is less. We plan to treat at 1.0 ppm and anticipate a closure of 2-3 days. The closure will be placarded throughout the treatment zone and the road will be blocked and manned by USFS and/ or FWP law enforcement officers. The aggregate risk to human health from food, water and swimming does not exceed the EPA level of concern (EPA 2007).

Recreationists in the area would likely not be exposed to the treatments because a temporary closure would preclude any from being in the area. Proper warning through news releases, signing the project area, road closure and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters. Administering application in late summer would further reduce exposure due to the relatively low number of users in this area.

Fisher (2007) conducted an analysis of the inert constituent ingredients found in the rotenone formulation of CFT Legumine for the California Department of Fish and Game. These inert ingredients are principally found in the emulsifying agent Fennodefo^{99} which helps make the generally insoluble rotenone more soluble in water. The constituents were considered because of their known hazard status and not because of their concentrations in the Legumine formulation. Solvents such as xylene, trichloroethylene (TCE) and tetrachloroethylene are residue left over from the process of extracting rotenone from the root and can be found in some lots of Legumine. However, inconsistent detectability and low occurrence in other formulations that used the same extraction process were below the levels for human health and ecological risk. Solvents such as toluene, *n*-butylbenzene, 1,2,4 trimethylbenzene and naphthalene are present in Legumine, and when used in other applications can be an inhalation risk. However, because of their low concentrations in this formulation, the human health risk is low. The remaining constituents, the fatty acid esters, resin acids, glycols, substituted benzenes, and *1*-hexanol were likewise present but either analyzed, calculated or estimated to be below the human health risk levels when used in a typical fish eradication project.

Methyl pyrrolidone is also found in CFT Legumine. It is known to have good solvency properties and is used to dissolve a wide range of compounds including resigns (rotenone). Analysis of Methyl pyrrolidone in CFT Legumine showed it represents about 9% of the formulation (Fisher 2007). The analysis concluded regarding the constituent ingredients in CFT Legumine;

> "…None of the constituents identified are considered persistent in the environment nor will they bioaccumulate. The trace benzenes identified in the solvent mixture of CFT Legumine™ will exhibit limited volatility and will rapidly degrade through photolytic and biological degradation mechanisms. The PEGs are highly soluble, have very low volatility, and are rapidly biodegraded within a matter of days. The fatty acids in the fatty acid ester mixture (Fennodefo99™) do not exhibit significant volatility, are virtually insoluble, and are readily biodegraded, although likely over a slightly longer period of

> time than the PEGs in the mixture. None of the new compounds identified exhibit persistence or are known to bioaccumulate. Under conditions that would favor groundwater exchange the highly soluble PEGs could feasibly transmit to groundwater, but the concentrations in the reservoir, and the rapid biodegradation of these constituents makes this scenario extremely unlikely. Based upon a review of the physical chemistry of the chemicals identified, we conclude that they are rapidly biodegraded, hydrolyzed and/or otherwise photolytically oxidized and that the chemicals pose no additional risk to human health or ecological receptors from those identified in the earlier analysis. None of the constituents identified appear to be at concentrations that suggest human health risks through water, or ingestion exposure scenarios and no relevant regulatory criteria are exceeded in estimated exposure concentrations…"

To limit exposure to those applying rotenone, proper safety equipment would be used according to the label requirements.

The advantage of CFT Legumine over Prenfish is that it has less petroleum hydrocarbon solvents such as toluene, xylene, benzene and naphthalene. By comparison, Prenfish has a strong chemical odor. CFT Legumine is virtually odor-free and performs almost identically to Prenfish.

Concern over a potential link between rotenone and Parkinson's disease often emerges in piscicide projects. Research into links between rotenone and PD include laboratory studies intended to induce PD-like symptoms in laboratory animals as a tool for neuroscientists to conduct PD-related research (Betarbet et al. 2000; Johnson and Bobvraskaya 2015), epidemiological studies of PD in farm workers (Kamel et al. 2006; Tanner et al. 2011), and laboratory studies evaluating risks associated with inhalation (Rojo et al. 2007). Laboratory studies inducing PD-like symptoms do not provide a relevant model for field exposure by humans. These studies entail injection into the bloodstream of extremely high concentrations of rotenone, often with a chemical carrier to facilitate absorption into tissue, for long durations. Such studies have little applicability to uses of rotenone as a piscicide.

Epidemiological studies do not provide clear evidence that rotenone has a causal link with PD. A recent study linked the use of rotenone and paraquat with the development of Parkinson's disease in humans later in life (Tanner et al. 2011). The after the fact study included mostly farmers from 2 states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. The results of epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011) and some have found it difficult determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking

pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD, which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of the study. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products. Laboratory studies of risks associated with inhalation of rotenone of concentrations likely encountered by fieldworkers have not found PD-like symptoms in exposed rodents (Rojo et al. 2007).

The state of Arizona conducted an exhaustive review to the risks to human health of rotenone use as a piscicide (Guenther et al. 2011). They concluded:

> "To date, there are no published studies that conclusively link exposure to rotenone and the development of clinically diagnosed PD. Some correlation studies have found a higher incidence of PD with exposure to pesticides among other factors, and some have not. It is very important to note that in case-control correlation studies, causal relationships cannot be assumed and some associations identified in odds-ratio analyses may be chance associations. Only one study (Tanner et al. 2011) found an association between rotenone and paraquat use and PD in agricultural workers, primarily farmers. However, there are substantial differences between the methods of application, formulation, and doses of rotenone used in agriculture and residential settings compared with aquatic use as a piscicide, and the agricultural workers interviewed were also exposed to many other pesticides during their careers. Through the EPA reregistration process of rotenone, occupational exposure risk is minimized by: new requirements that state handlers may only apply rotenone at less than the maximum treatment concentrations (200 ppb), the development of engineering controls to some of the rotenone dispensing equipment and requiring handlers to wear specific PPE."

To reduce the potential for exposure of the public to rotenone during the proposed treatment, areas treated with rotenone would be closed to public access. Placard signs would be placed at access points informing the public of the closure and the presence of rotenone treated waters.

Personnel would be onsite to inform the public and escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by adding potassium permanganate to the stream at the downstream end of the treatment area (fish barrier). Potassium permanganate would deactivate any remaining rotenone before leaving the project area. The efficacy of the deactivation would be monitored using fish (the most sensitive species to the chemical) and a hand-held chlorine meter. Therefore, the potential for public exposure to rotenone treated waters is very minimal. The potential for exposure would be greatest for those certified applicators and operators applying the chemical. To reduce their exposure, label mandates for personal protective equipment would be adhered to (see Comment 8a).

3.2.5 Community Impact

9. COMMUNITY IMPACT **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

3.2.6 Public Services/Taxes/Utilities

10. PUBLIC SERVICES/TAXES/UTILITIES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered		X				

governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____						
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

3.2.7 Aesthetics/Recreation

11. AESTHETICS/RECREATION **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		yes	See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c:

There will be a temporary loss of angling opportunity at Martin Creek between the time of fish removal and the restocking. However, this project is specifically intended to improve angling quality at Martin Creek, which may result in increased use by recreationists. The benefits of increased recreational use would outweigh any impacts associated with the actual treatment. Any impacts to aesthetics would be short term and minor and be directly associated with the actual treatment and immediate aftermath, including dead fish in the project area. A tourism report is not necessary to quantify these impacts.

3.2.8 Cultural/Historic Resources

12. CULTURAL/HISTORIC RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c:

The project site is located within the aboriginal range of the Confederated Salish and Kootenai Tribes of the Flathead Nation. In July 2006, cultural officers for the tribe were contacted. To date there have been no cultural or religious resources identified at the project site. There will be no ground-breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There will be no impacts to historical, cultural or religious values.

Salish and Kootenai Tribal Council
PO Box 278
Pablo, MT 59855

3.2.9 Summary Evaluation of Significance

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X				yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X					13f
g. List any federal or state permits required.						13g

Comment 13e

The use of pesticides can generate controversy from some people. Public scoping held between March 6 and April 6 produced input from 5 individuals. Of these, 3 individuals expressed outright opposition to the project. Public outreach and information programs can educate the public on the use of pesticides.

Comment 13f

It is unknown if this project will have organized opposition. Public scoping for the project resulted in five responses suggesting little interest from much of the public.

Comment 13g

The following permit would be required:

- MDEQ Pesticide General Permit

ALTERNATIVES

3.3 *Alternatives Evaluated*

3.3.1 Alternative 1 – No Action

The no action alternative would allow status quo management to continue. The fishery would be unlikely to change and there is no conservation value in this alternative. Piscicides would not be applied to Martin Creek and WCT would not be restored to the creek. This alternative would not meet FWP's objective of conserving WCT in the Stillwater River drainage.

3.3.2 Alternative 2 – Proposed Action

The proposed action involves applying the piscicide rotenone to the upper five miles of Martin Creek above the falls to remove nonnative hybridized cutthroat trout. Following the treatment Westslope Cutthroat Trout indigenous to the Stillwater River Drainage will be stocked into the creek to reestablish the fishery. If completed, this project will substantially expand the range of native Westslope Cutthroat Trout in the drainage and contribute towards FWP's objective to restore, maintain and protect native species and their habitats. Potassium permanganate would be applied to the creek at the falls to neutralize the rotenone and prevent impacts to down stream fisheries. Based on rotenone projects that FWP has conducted elsewhere and habitat surveys in the project area it is likely that this project would be successful.

3.3.3 Alternative 3 – Mechanical suppression using backpack electrofishers

Numerous attempts have been made to remove unwanted fish using electrofishing in streams. FWP conducted an electrofishing removal of brook trout from 6 km of stream above a barrier on Muskrat Creek (Shepard, et al. 2001). Over a four-year period, researchers electrofished 5,386 brook trout from this section and moved them below a barrier. After four years of the electrofishing effort, they concluded that the operation was not 100 percent effective and recommended that some type of fish toxin be used to permanently eliminate the brook trout from the study section.

Electrofishing small streams where using piscicides is not feasible has had mixed results. Moore et al. (1983) reported that electrofishing did not eliminate rainbow trout from a Tennessee stream, but helped reduce their numbers which help native brook trout re-establish. Thompson and Rahel (1996) reported similar results using electrofishing for brook trout removals to aid native cutthroat trout in a Wyoming stream. Kulp and Moore (2000) reported that five removals were required to successfully eliminate rainbow trout from Mannis Branch Creek, Tennessee.

Shepard et al (2014) described conditions under which electrofishing could be successfully used to eradicate brook trout from small mountain streams in Montana. They found that it took 6-10 multiple-pass treatments to be successful at eradication. Eradication by electrofishing cost $3,500-

$5,000 per km (2005 dollars) where no riparian vegetation or woody debris clearing was necessary, increasing to $8,000-$9,000 per km where clearing was necessary.

The Montana Bull Trout Restoration Team evaluated electrofishing as a possible means to remove competing fish species to aid in bull trout recovery. The team concluded that electrofishing could be used to help suppress target species but would not likely be successful in total removal (FWP 1996).

In conclusion, mechanical removal can be an effective method of removal of nonnative species under limited circumstances. The length of stream is a major consideration. Mechanical removal has been effective in streams reaches from approximately 1.5- to 2 miles long; however, the level of effort can be considerable, with up to 14 treatments of up to 4 electrofishing passes required (Shepard et al. 2014). Habitat complexity is another concern, with electrofishing being ineffective in complex habitat. Removal of woody debris and riparian vegetation increases probability of removal using mechanical means but adds considerably to project costs. Moreover, debris removal may not be feasible in large scale projects with remote tributaries and substantial amounts of woody debris. Finally, mechanical removal is not feasible in large, connected watersheds with complex habitat, given limitations in the amount of available labor, the need for numerous barriers, and constraints on capture efficiency. This reality presents a challenge for conservation practitioners since large, complex, interconnected habitats provide the greatest opportunity for long term population persistence.

For these reasons this alternative was eliminated from further consideration.

3.3.4 Alternative 4 - Angling

Angling is not a viable means of meeting project goals of eradication due to its inefficiency and the difficulty in fishing in remote headwaters. Fry and age-1 fish are invulnerable to fishing and would mature to provide a perpetual source of the targeted species. Moreover, fish targeted for removal often live in high gradient streams covered by deadfall timber. These relatively unfishable reaches would harbor nonnative fish and be a continual source of fish to invade the waters below. Angling may have a role as an addition to other measures; however, because angling would not eliminate all nonnative fish, or appreciably decrease numbers or distribution in many watersheds, it will not be considered further in this document.

4 Public Comments Instructions

The comment period is 30 days. Comments must be received by July 15, 2020.

Submit written comments to:

Sam Bourret
Montana Fish, Wildlife & Parks
Region 1
490 North Meridian Road
sbourret@mt.gov
406-751-4556

and / or

Kenneth Breidinger
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Prepared by: Sam Bourret Date: June 4, 2020

5 LITERATURE CITED

AFS (American Fisheries Society). 2002. Rotenone stewardship program, fish management chemicals subcommittee. www. fisheries. org/rotenone/.

Anderson, N. H. and J. B. Wallace. 1984. Habitat, life history, and behavioral adaptations of aquatic insects. Pages 38-58 in R. W. Merritt and K. W. Cummins (eds.), An introduction to the aquatic insects of North America. 2nd ed. Kendall/Hunt Publishing, Dubuque, Iowa.

Atkinson, E. C. and C. R. Peterson. 2000. Amphibians and reptiles of the Gallatin National Forest, Montana. Bozeman, Montana.

Benjamin JR, Fausch KD, Baxter CV. 2011. Species replacement by a nonnative salmonid alters ecosystem function by reducing prey subsidies that support riparian spiders. Oecologia 167: 503–512

Betarbet, R., T. B. Sherer, G. MacKenzie, M. Garcia-Osuna, A. V. Panov, and T. Greenamyre. 2000. Chronic systemic pesticide exposure reproduces features of Parkinson's disease. Nature Neuroscience. 3 (12): 1301-1306.

Billman, H. G., S. St-Hilaire, C. G. Kruse, T. S. Peterson, and C. R. Peterson. 2011. Toxicity of the piscicide rotenone to Columbia spotted frog and boreal toad tadpoles. Transactions of the American Fisheries Society 140:919-927.

Billman, H. G., C. G. Kruse, S. St-Hilaire, T. M. Koel, J. L. Arnold, and C. R. Peterson. 2012. Effects of rotenone on Columbia spotted frogs Rana luteiventris during field applications in lentic habitats in southwestern Montana. North American Journal of Fisheries Management. 32:781-789.

Boulton, A. J., C. G Peterson, N. B. Grimm, and S. G. Fisher. 1992. Stability of an aquatic macroinvertebrate community in a multiyear hydrologic disturbance regime. Ecology. 73 (6):2192-2207.

Bradbury, A. 1986. Rotenone and trout stocking: a literature review with special reference to Washington Department of Game's lake rehabilitation program. Fisheries management report 86-2. Washington Department of Game.

BRL (Biotech Research Laboratories). 1982. Analytical studies for detection of chromosomal aberrations in fruit flies, rats, mice, and horse bean. Report to U. S. Fish and Wildlife Service (USFWS Study 14-16-0009-80-54). National fishery research Laboratory, La Crosse, Wisconsin.

Burckhardt, J, B. Bradshaw, J. Deormedi, R. Gipson, and M. Smith. 2014. A plan for the management and conservation of Yellowstone cutthroat trout in Wyoming. Wyoming Game and Fish Department, Cheyenne, Wyoming.

CDFG (California Department of Fish and Game), 1994. Rotenone use for fisheries management, July 1994, final programmatic environmental impact report. State of California Department of Fish and Game.

Chandler, J. H. and L. L. Marking. 1982. Toxicity of rotenone to selected aquatic invertebrates and frog larvae. The Progressive Fish Culturist. 44(2):78-80.

Cook, S. F. and R. L. Moore. 1969. The effects of a rotenone treatment on the insect fauna of a California stream. Transactions of the American Fisheries Society 83 (3):539-544.

Cutkomp, L. K. 1943. Toxicity of rotenone to animals: a review and comparison of responses shown by various species of insects, fishes, birds, mammals, etc. Soap and Sanitary Chemicals. 19(10):107-123.

Dawson, V. K., W. H. Gingerich, R. A. Davis, and P. A. Gilderhus. 1991. Rotenone persistence in freshwater ponds: effects of temperature and sediment adsorption. North American Journal of Fisheries Management. 11:226-231.

Dunham J. B., G. L. Vinyard, and B. E. Rieman. 1997. Habitat fragmentation and extinction risk of Lahontan cutthroat trout. North American Journal of Fisheries Management 17: 1126-1133.

Durkin, P. R. 2008. Rotenone Human Health and Ecological Risk Assessment: FINAL REPORT. USDA Forest Service Contract: AG-3187-C-06-0010, USDA Forest Order Number: AG-43ZP-D-07-0010, SERA Internal Task No. 52-11. Syracuse Environmental Research Associates, Inc. Fayetteville, New York. 152 pages + appendices. Available at: http://www. fs. fed. us/forest health/pesticide/pdfs/0521103a_Rotenone. pdf

Endicott, C. E. and 12 other authors. 2013. Yellowstone cutthroat trout conservation strategy for Montana. Montana Fish, Wildlife & Parks. Livingston, Montana.

Endicott, C. E. and 7 other authors. 2012. Yellowstone cutthroat trout for the Shields River watershed above the Chadbourne diversion. Report prepared for the Montana Cutthroat Trout Steering Committee.

Engel LS, Seixas NS, Keifer MC, Longstreth WTJ & Checkoway H. 2001. Validity study of self-reported pesticide exposure among orchardists. J Expo Anal Environ Epidemiol, 11, 359–368

Engstrom-Heg, R, R. T. Colesante, and E. Silco. 1978. Rotenone tolerances of stream-bottom insects. New York Fish and Game Journal. 25 (1):31-41.

Engstrom-Heg, R. 1971. Direct measure of potassium permanganate demand and residual potassium permanganate. New York Fish and Game Journal. 18(2):117-122.

EPA, 2007. United States Environmental Protection Agency, prevention, pesticides and toxic substances (7508P). EPA 738-R-07-005. Reregistration Eligibility Decision for Rotenone, List A Case No. 0255.

Finlayson, B. J., R. A. Schnick, R. L. Cailteux, L. DeMong, W. D. Horton, W. McClay, C. W. Thompson, and G. J. Tichacek. 2000. Rotenone use in fisheries management: administrative and technical guidelines manual. American Fisheries Society, Bethesda, Maryland.

Fisher, J. P. 2007. Screening level risk analysis of previously unidentified rotenone formulation constituents associated with the treatment of Lake Davis. for California Department of Fish and Game. Environ International Corporation, Seattle, Washington.

Fried, L. M, M. C. Boyer, and M. J. Brooks. 2018. Amphibian Response to Rotenone Treatment of Ten Alpine Lakes in Northwest Montana. North American Journal of Fisheries Management 38:237-246.

FWP. 2014. Statewide fisheries management plan. Montana Fish, Wildlife & Parks, Helena, Montana.

FWP. 2012. Piscicide Policy. Montana Fish, Wildlife & Parks, Fisheries Bureau.

Gilderhus, P. A., J. L. Allen, and V. K. Dawson. 1986. Persistence of rotenone in ponds at different temperatures. North American Journal of Fisheries Management. 6: 129-130.

Gilderhus, P. A., V. K. Dawson, and J. L. Allen. 1988. Deposition and persistence of rotenone in shallow ponds during cold and warm seasons. US Fish and Wildlife Service Investigations in Fish Control, No. 5

Gingerich, W. and J. Rach. 1985. Uptake, accumulation and depuration of 14C-rotenone in blue gills (Lepomis macrochirus). Aquatic Toxicology 6:170-196.

Gleason, M., R. Gosselin, H. Hodge, and P. Smith 1969. Clinical toxicology of commercial products. The William and Wilkins Company, Baltimore, Maryland.

Grisak, G. G., D. R. Skaar, G. L. Michael, M. E. Schnee and B. L. Marotz. 2007. Toxicity of Fintrol (antimycin) and Prenfish (rotenone) to three amphibian species. Intermountain Journal of Sciences. 13(1):1-8.

Hertzman C, Wiens M, Snow B, Kelly S & Calne D. 1994. A case–control study of Parkinson's disease in a horticultural region of British ColumFbia. Mov Disord, 90: 69–75

Hisata, J. S. 2002. Lake and stream rehabilitation: rotenone use and health risks. Final supplemental environmental impact statement. Washington Department of Fish and Wildlife, Olympia. Washington.

Houf, L. J. and R. S. Campbell. 1977. Effects of antimycin a and rotenone on macrobenthos in ponds. Investigations in fish control number 80. U. S. Fish and Wildlife Service. Fish Control Laboratory, LaCrosse, Wisconsin.

HRI (Hazelton Raltech Laboratories). 1982. Teratology studies with rotenone in rats. Report to U. S. Geological Survey. Upper Midwest Environmental Sciences Center (USFWS Study 81-178). La Crosse, Wisconsin.

Hubble JP, Cao T, Hassanein RES, Neuberger JS & Koller WC. 1993 Risk factors for Parkinson's disease. Neurology, 43:1693-1697.

Isaak, DJ, Wenger, SJ, Peterson EE, et al. 2017. The NorWest summer stream temperature model and scenarios for the western U.S.: A crowd-sourced database and new geospatial tools foster a user community and predict broad climate warming of rivers and streams. Water Resourses Research, 53: 9181-9205.

Jiménez-Jiménez FJ, Mateo D & Giménez-Roldán S. 1992. Exposure to well water and pesticides in Parkinson's disease: Acase–control study in the Madrid area. Mov Disord, 7, 149–152.

Johnson, M. E. and L. Bobrovskaya. 2015. An update on the rotenone models of Parkinson's disease: Their ability to reproduce the features of clinical disease and model gene-environment interactions. Neurotoxicity 46:101-116.

Koel, T. M., J. L. Arnold, P. E. Bigelow and M. E. Ruhl. 2010. Native fish conservation plan. *Environmental assessment. National Park Service, U. S. Department of the Interior,* Yellowstone National Park. December 16, 2010. http://parkplanning. nps. gov/projectHome. cfm?projectID=30504

Kruse, C. G., W. A. Hubert, and F. J. Rahel. 2000. Status of Yellowstone cutthroat trout in Wyoming waters. North American Journal of Fisheries Management 20: 693-705.

Lai, BCL, Marion SA, Teschke K & Tsui JKC. 2002. Occupational and environmental risk factors for Parkinson's disease. Parkinsonism Rel Disord, 8:297–309

Leary, R. 2005. Genetics letter to Jim Olsen. University of Montana Conservation Genetics Laboratory, Division of Biological Sciences, University of Montana, Missoula, Montana.

Leary, R. 2014. Genetics letter to Todd Koel. University of Montana Conservation Genetics Laboratory, Division of Biological Sciences, University of Montana, Missoula, Montana.

Lepori F., Benjamin J. R., Fausch K. D. and C. V. Baxter. 2012 Are invasive and native trout functionally equivalent predators? Results and lessons from a field experiment. Aquatic Conservation of Marine Freshwater Ecosystems. 22: 787–798.

Lui, Y, J. D. Sun, L. K Song, J. Li, S. Chu. Y. Yuan, and N. Chen. 2015. Environment-contact administration of rotenone: A new rodent model of Parkinson's disease. Behavioral Brain Research 294:149-161.

Marking, L. L. 1988. Oral toxicity of rotenone to mammals. Investigations in fish control, technical report 94. U. S, Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin.

Matthaei, C. D., Uehlinger, U., Meyer, E. I., Frutiger, A. 1996. Recolonization by benthic invertebrates after experimental disturbance in a Swiss prealpine river. Freshwater Biology. 35(2):233-248.

Maxell, B. 2009. Distribution, identification, status, and habitat use of Montana's amphibians and reptiles. Montana Natural Heritage Program. Helena, Montana.

Maxell, B. A., and D. G. Hokit. 1999. Amphibians and Reptiles. Pages 2. 1-2. 29 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pp.

Mihuc, T. B. and G. W. Minshall. 1995. Trophic generalists vs. trophic specialists: implications for food web dynamics in post-fire streams. Ecology 76(8):2361-2372

Minshall, G. W. 2003. Responses of stream benthic invertebrates to fire. Forest Ecology and Management. 178:155-161.

Montana Cutthroat Trout Steering Committee (MCTSC). 2007. Memorandum of understanding and conservation agreement for westslope cutthroat trout and Yellowstone cutthroat trout in Montana.

National Academy of Sciences NAS. 1983. Drinking water and health, volume 5. Safe Drinking Water Committee Board of Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, National Academy Press, Washington D. C.

Olsen, J. R. 2017. Streams Surveyed in the Big Hole Drainage 2010-2016. Federal Aid Project Number: F-113 April 1, 2011 – April 1, 2017. Montana Fish, Wildlife and Parks, Helena, MT.

Pennack, 1989. Freshwater Invertebrates of the United States, John Wouldey & Sons and Company, New York, New York.

Peterson, D. P, B. E. Rieman, J. B. Dunham, K. D. Fausch, and M. K. Young. 2008. Analysis of trade-offs between threats of invasion by nonnative brook trout (*Salvelinus fontinalis*) and intentional isolation for native westslope cutthroat trout (*Oncorhynchus clarkii lewisi*). Canadian Journal of Fisheries and Aquatic Sciences 65:557-573.

Pihls, A. 2015. Biological assessment for terrestrial wildlife species for Soda Butte Creek Yellowstone cutthroat trout restoration project. Shoshone National Forest, Cody, Wyoming.

Rojo, A. I. C. Cavada, M. R. de Sagarra, and A. Cuadrado. 2007. Chronic inhalation of rotenone or paraquat does not induce Parkinson's disease symptoms in mice or rats. Experimental Neurology 208:120-126.

Schnick, R. A. 1974. A review of the literature on the use of rotenone in fisheries. USDI Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, LaCrosse, Wisconsin.

Shepard, B. B. 2010. Evidence of niche similarity between cutthroat trout (*Oncorhynchus clarkii*) and brook trout (*Salvelinus fontinalis*): implications for displacement of native cutthroat trout by nonnative brook trout. Doctoral Dissertation, Montana State University, Bozeman, Montana.

Shepard, B. B. and L. Nelson. 2001. Westslope cutthroat trout restoration in Muskrat Creek, Boulder River drainage, Montana: Progress report for period 1993 to 2001. Montana Fish, Wildlife & Parks, Helena, Montana.

Shepard, B. B., L. M. Nelson, M. L. Taper, and A. V. Zale. 2014. Factors influencing successful eradication of nonnative brook trout from four small Rocky Mountain streams using electrofishing. North American Journal of Fish Management.

Shepard, B. B., M. Taper, R. G. White, and S. C. Ireland. 1998. Influence of abiotic and biotic factors on abundance of stream-resident westslope cutthroat Trout Oncorhynchus clarki lewisi in Montana streams. Final report to USDA Forest Service, Rocky Mountain Research Station, Boise, Idaho for contract INT-92682-RJVA. Montana Cooperative Fishery Research Unit, Montana State University, Bozeman.

Skaar, D. 2001. A brief summary of the persistence and toxic effects of rotenone. Montana Fish, Wildlife & Parks, Helena.

Van Goethem, D, B. Barnhart, and S. Fotopoulos. 1981. Mutagenicity studies on rotenone. Report to U. S. Geological Survey. Upper Midwest Environmental Sciences Center (USFWS Study 14-16-009-80-076), La Crosse, Wisconsin

Ware, G. W. 2002. An introduction to insecticides 3rd edition. University of Arizona, Department of Entomology, Tuscon. on EXTOXNET. Extension Toxicology Network. Oregon State University web page.

Werner, J. K., B. A. Maxell, P. Hendricks, and D. L. Flath, 2004. Amphibians and reptiles of Montana. Mountain Press Publishing Company, Missoula, Montana.

Werner, J. K., B. A. Maxell, P. Hendricks, and D. L. Flath. 2004. Amphibians and Reptiles of Montana. Mountain Press Publishing Company, Missoula, Montana. 262 pp.

Wohl, N. E. and R. F. Carline. 1996. Relations among riparian grazing, sediment loads, macroinvertebrates, and fishes in three Pennsylvania streams. Canadian Journal of Fisheries and Aquatic Sciences. 53:260-266.